

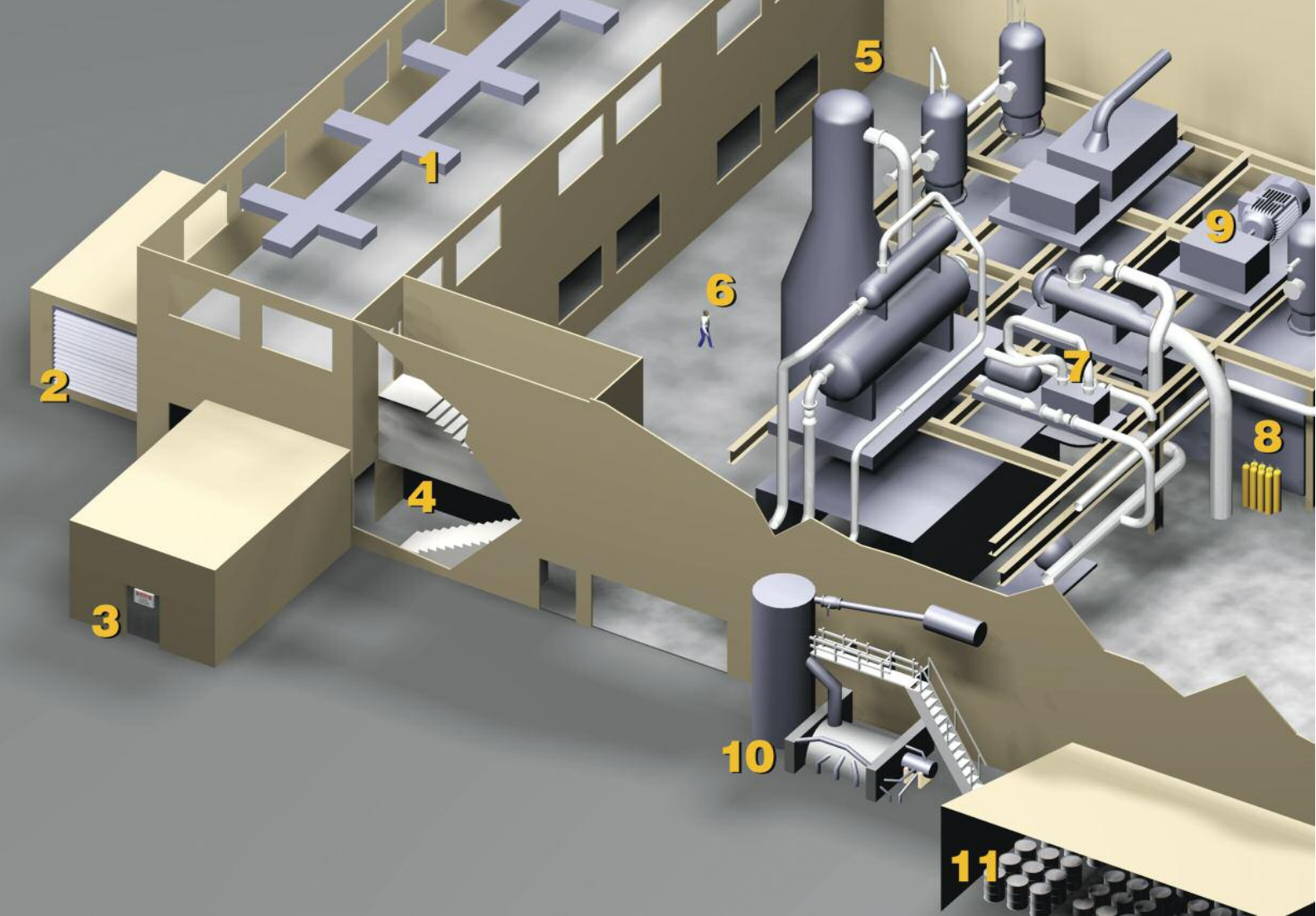
MSA Guide to Sensor Selection and Placement



Oil, Gas & Petrochemical Industry



*Because every life has a **purpose...***



Typical Gas Detection Locations in a Facility

| Number | Type of Monitoring |
|--------|--|
| 1, 4 | lighter than air gases (e.g., hydrogen, methane) |
| 2 | toxic gases, combustible gases |
| 3 | confined spaces (oxygen deficiency, toxic gases) |
| 5 | room corners, pockets, other collection points |
| 6 | oxygen deficiency, toxic gases |
| 7 | process leaks |
| 8 | combustion processes (CO ₂ , toxic gases, fuel leaks) |
| 9 | electric motor monitoring (source of ignition) |
| 10 | toxic gases, combustible gases, heavy hydrocarbons |
| 11 | toxic gases, combustible gases |

MSA Guide to Gas Sensor Selection and Placement

STEP 1: To determine sensor placement, perform a potential gas hazard assessment within your facility.

STEP 2: Create drawings indicating all potential leak sites, as well as the severity of each site's hazard potential.

Please note these two main hazardous location categories:

A. Potential gas discharge points. These areas are locations where hazardous gases may be released, such as valve stem seals, gaskets, compression fittings and expansion joints.

B. Potential contact areas. These areas are locations where hazardous gases may endanger workers or damage equipment or property. Examples include populated areas, confined spaces, pits, stairwells, crawl spaces, shelters, and residential, business, and industrial environments located nearby.

STEP 3: As gases do not always behave consistently, consider air flow conditions as well as potential gas pocket areas before placing sensors. Ventilation Smoke Tubes can be useful in measuring air flow direction and rate in order to determine areas of gas accumulation. In general, when placing sensors, the following principles should be considered:

DO

- Place sensors in areas where air currents are likely to produce the highest gas concentration, including areas where gas buildup is likely, such as corners or stopping points of gas-releasing moving devices.
- Place sensors close to the possible gas/leak source.
- Place combustible gas sensors between the potential leak and ignition source.
- Place toxic and oxygen deficiency sensors between potential leak areas and populated areas, and in the workers' breathing zone.
- Consider ease of sensor access for maintenance requirements such as periodic calibration. Use remote sensors for higher inaccessible locations.
- Install in a position that prevents sensor head water or dust accumulation, as it may impede gas diffusion into the sensor. Preferred position is facing downward; horizontal placement is also acceptable.
- Ensure that the entire area in question is sufficiently monitored, including little-used areas such as closets, warehouses and other storage areas.
- Factor in the monitored gas's vapor density when compared to air:

| Gases | Gas Density | Sensor Placement |
|------------------------------------|------------------|---|
| carbon dioxide, heavy hydrocarbons | greater than air | closer to the ground |
| hydrogen, methane | less than air | near the ceiling |
| carbon monoxide, nitrogen | similar to air | according to air current path, at or near breathing level (usually 4 to 6 ft. from floor) |

DON'T

- Don't place sensors near entrances or fresh air vents during representative room sampling, as sample concentrations will be diluted by incoming air.
- Don't place sensors in locations where airborne particles may coat or contaminate sensors, such as paint booths.
- To reduce possible RFI interference, don't mount sensors near radio transmitters or other RFI-producing sources (e.g., welding and induction heaters).

Combustible Gas Sensors

- Hydrogen and methane are lighter than air; place sensors near ceiling and in ceiling corners where pockets of air may collect.
- For electric motor monitoring, place sensors near the ignition source.
- **Note:** When monitoring multiple combustible gases, set the instrument alarm level for the least sensitive gas.

Toxic & Oxygen Gas Sensors

- Place carbon monoxide and carbon dioxide sensors for indoor air quality monitoring at air conditioning ducts.
- Monitor for oxygen and toxic gases in the workers' breathing zone (4–6') of occupied areas (e.g., confined spaces).

Toxic & Combustible Sensors

- Place sensors near process monitoring applications potential release sources (example: pipelines, valves).
- Gas cylinder storage areas: if these are ventilated, place sensor near return air vent.
- Acid/solvent drum storage areas: these gases are heavier than air (e.g., heavy hydrocarbons); place sensors close to the ground and in corners where air may collect in pockets.
- Place sensors near air intake for both combustible and toxic gas monitoring.
- Some gases may collect in pockets in room corners, at both floor and ceiling levels. Place sensors in these areas if necessary.

Refrigerant Monitor Placement

- Place sample line ends within locations most likely to develop refrigerant gas leaks or spills. Such areas include valves, fittings and the chiller itself. Also, monitor any refrigerant storage location. It is good practice to keep all sampling lines as short as possible.
- Since most refrigerant gases are heavier than air, monitor these gases close to the floor. Any pits, stairwells, or trenches are likely to fill with refrigerant gas before main areas; it may be necessary to monitor these locations for refrigerant gas.
- If ventilation exists in chiller rooms, MSA Ventilation Smoke Tubes (P/N 458481) will help to determine the most appropriate gas monitoring location.
- Monitor displays can be placed just outside of monitored area doorways. Personnel can check instrument status before entering these areas.
- Ensure that areas are sufficiently monitored; multipoint sequencers can expand instrument monitoring capability to up to eight locations.

General rule for sensor placement:

Point-type sensors should be considered for every 50' radius, unless other conditions such as those mentioned above indicate the need for additional sensors.

Note: This bulletin is provided for informational purposes only and is intended to serve as a general guide to important sensor placement considerations. This bulletin is not intended to serve as an exhaustive review of all considerations. Due to the large number of variables present, each site should be assessed individually by a trained professional. The services of a **Certified Industrial Hygienist (CIH)** or **Certified Safety Professional (CSP)** should be considered if an on-site survey is required.

MSA's Repair and Service Department

is well-trained in sensor usage and custom options, and can repair and service complete instrument systems. Contact your local MSA Gas Detection sales representative for details on repair and service or how our Custom Products Group can provide custom solutions for your specific applications.

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